
3.0 BASELINE FOR ESTIMATING BENEFITS AND COSTS

Analysis of the potential benefits and costs associated with implementation of the Phase II Storm Water Rule requires that a baseline be established. The baseline provides an initial starting point for measuring the incremental cost and benefit of regulatory compliance. This chapter describes the baseline EPA established for analyzing impacts to construction activities and municipalities regulated by the Phase II rule. It also discusses baseline water quality conditions, including water quality impairment potentially attributable to Phase II sources.

3.1 Existing Storm Water Programs

Analysis of the incremental costs and benefits requires that EPA identify regulatory programs that resemble the Phase II program at the federal, state, and local levels. Those programs with the greatest likelihood of overlap with the Phase II program requirements include the Phase I storm water program implemented under the National Pollutant Discharge Elimination System program implemented by certain authorized states; the Coastal Zone Authorization Reauthorization Act Amendments of 1990 program for the control of nonpoint source pollution; and state and local erosion and sediment control programs.

3.1.1 Phase I Storm Water Program

Some states that are authorized to regulate storm water discharges under the National Pollutant Discharge Elimination System (NPDES) program have chosen to implement more stringent requirements than those required by the Phase I rule (55 FR 47990, November 16, 1990). Specifically, a few states have expanded the Phase I storm water universe to include sources that would otherwise be regulated under the Phase II program. This includes lowering the five acre minimum size threshold for regulation of construction activity and designating certain “small” municipalities, thus mandating their participation in the Phase I storm water program. EPA does not include Phase I communities in the Phase II universe.

3.1.2 CZARA Program

The Coastal Zone Authorization Reauthorization Act Amendments of 1990 (CZARA) established requirements for states located in the coastal zone to implement controls that manage nonpoint source runoff. This includes the implementation of an enforceable erosion and sediment program for the control of runoff from construction sites disturbing less than five acres of land. The Phase II rule establishes similar requirements for owners and operators of construction sites that disturb between one and five acres. The overlap between the two programs is restricted to the implementation of erosion and sediment controls, or storm water BMPs. Additional requirements established by the Phase II program include the development of a storm water pollution prevention plan, inspections and regular maintenance of the controls, and the submittal of a notice of intent to be covered by the general permit and notice of termination.

In the analysis that accompanied the proposed rule, EPA included costs for sediment and erosion controls in coastal areas because programs developed under CZARA were not yet implemented. Since the proposed rule, states have more fully implemented sediment and erosion control programs recommended through CZARA. EPA assumed that where state programs are as

stringent as Phase II and applied as the primary enforcement tool for regulating construction site runoff the Phase II rule will not add incremental costs or benefits. Therefore, costs and benefits associated with implementing Phase II have not been analyzed for the coastal zones in ten states that have instituted such sediment and erosion control programs in response to CZARA: Delaware, Florida, Maryland, Massachusetts, Michigan, New Jersey, Pennsylvania, Rhode Island, South Carolina, and Virginia.

3.1.3 State and Local Erosion and Sediment Control Programs

A number of states (including the District of Columbia) and one territory require erosion and sediment controls, irrespective of CZARA, on construction sites that disturb less than five acres of land. For example, North Carolina's Erosion and Sediment Control Act of 1973 requires BMPs for all construction sites of one or more acres while West Virginia regulates sites that are three or more acres in size. States with established erosion and sediment control programs are shown in Exhibit 3-1. EPA accounted for these programs by not estimating benefits or costs associated with erosion and sediment controls for sites regulated by an equivalent program.

In addition to federal and state programs, some municipalities have developed local programs that require the owners or operators of construction sites disturbing less than five acres of land to implement erosion and sediment controls although the extent of these programs is unknown. A recent study by the Center for Watershed Protection (1997) reported survey responses from 113 locales with erosion and sediment control programs (a 52% response rate). This survey indicated that 27% of the responding locales required erosion and sediment controls on construction sites disturbing less than 0.5 acres of land and 43% required erosion and sediment controls at construction sites disturbing between one and five acres of land. However, EPA does not know the extent to which these local programs are similar to Phase II. Therefore, EPA chose to assume that there are no pre-existing local programs that duplicate Phase II requirements.

3.2 Population

To estimate the benefits of the Phase II rule, EPA used the most current estimate of the 1998 US population: 270 million residents with 2.62 persons per household (US Census Bureau, 1998a). These figures yield an estimate of 103 million households nationwide. However, to estimate the potential compliance costs of the Phase II rule, EPA needed to identify the sewered population. EPA used the most recent sewered population estimate from 1993 of 227.8 million persons (US Census Bureau, 1993) and assumed that this population represents the 1998 sewered population. In addition, EPA needed to estimate the population residing in automatically designated Phase II communities. To accomplish this, EPA used 1990 estimates of the urban population and US Census Bureau projections of the year 2000 population to arrive at 1998 estimates. The 1998 estimate is 85.2 million persons which is equivalent to 32.5 million households. Assuming that the automatically designated Phase II population is entirely sewered, EPA estimates that 37.4% of the total sewered population resides in these Phase II communities. The estimates of the population residing in Phase II communities excludes residents in communities with pre-existing equivalent municipal programs. Exhibit 3-2 presents a summary of the above estimates. The exhibit also reports the estimates for the potentially designated Phase II population which are households in unurbanized areas. These households represent an additional 5.2% of the US sewered households.

Exhibit 3–1. States and Territories Requiring Erosion and Sediment Controls at Construction Sites of Less than Five Acres

State or Territory	Minimum Construction Site Size Requiring Controls (Acres, Unless Specified)
Connecticut	0.5
Delaware*	5,000 (square feet)
District of Columbia	50 (square feet)
Florida*	0
Georgia	1.1
Maryland*	1
Massachusetts*	0.5
Michigan*	1
New Hampshire	50,000 or 100,000 (square feet)
New Jersey*	5,000 (square feet)
North Carolina	1
Pennsylvania*	0 ¹
Puerto Rico	900 (square meters)
Rhode Island*	0
South Carolina*	0 ²
Virginia*	2,500 or 10,000 (square feet)
West Virginia	3
Wisconsin	1.5 acres for residential development 3 acres for commercial development

¹All earth-moving activities.²Any activity.

*denotes CZARA

Exhibit 3–2. Municipal Households Potentially Regulated Under the Phase II Rule

Community Type	Households	Percent of US Sewered Households
Urbanized Place, County, Minor Civil Division ¹	32,458,365 ²	37.4%
Unurbanized Place, County, Minor Civil Division ³	4,539,440	5.2%
Total	37,062,643	37.4%–42.6%

¹Automatically designated.

²Based on a population estimate of 85,189,912 and 2.6246 persons per household. EPA used this estimate of households in the cost analyses because it reflects those households which may bear the costs of implementing a municipal program.

³Potentially designated.

Source: US Census Bureau (1998a).

3.3 Phase II Construction and Land Development Activities

To estimate the percent of construction and land development activities (see Section 3.4 below) that may be affected by the Phase II soil erosion control provisions, EPA first developed an estimate of the percentage of construction starts on one to five acres using data collected from fourteen areas of the country: Tucson, Arizona; Fort Collins, Colorado; New Britain, Connecticut; Tallahassee, Florida; South Bend, Indiana; Cary and Raleigh, North Carolina; Baltimore County and Prince Georges County, Maryland; Austin, Texas; Loudon County, Virginia; and Lacey and Olympia, Washington; and Waukesha, Wisconsin. EPA then multiplied this percentage by the number of building permits issued nationwide to determine the total number of construction starts occurring on one to five acres nationwide. Next, to isolate the number of construction and land development activities regulated by Phase II, EPA subtracted the number of activities regulated under equivalent programs. Exhibit 3–3 shows that approximately 110,000 sites may be affected by this provision by site size; this estimate excludes approximately 19,500 sites that EPA estimates will qualify for waivers. Dividing this number by the estimated total number of 521,000 construction starts nationwide for 1998 indicates that 21.1% of construction starts may be regulated under this provision of the Phase II rule. This methodology is presented in detail in Appendix B–2.

Exhibit 3–3 also shows the cumulative percentages for regulating all sites equal to or greater than each of the size categories shown. For example, if all sites regardless of size were regulated, then 100% of disturbed area and sites would be regulated. By lowering the compliance threshold from five acres to one acre of disturbed area, the Phase II rule effectively raises the share of regulated sites from 36% to 75%, and the share of total disturbed area from 78% to 98%.

Exhibit 3–3. Estimated Number of Total Construction Starts and Construction Starts Potentially Affected by the Phase II Soil Erosion Control Provision¹

Area Acreage	Construction Starts (1998)			
	Total National Starts	Incremental Starts Potentially Affected by the Phase II Rule ^{2,3}	Total Percentage of National Disturbed Area Controlled by Regulating All Sites	Total Percentage of National Starts Regulated
Less than one acre	130,328	0	100%	100%
One to two acres	93,063	52,426	98%	75%
Two to four acres	79,322	41,389	92%	57%
Four to five acres	32,557	16,408	84%	42%
More than five acres	186,198	0	78%	36%
Total	521,467	110,223	na	na

Detail may not add to total due to independent rounding.

¹The area acreage values reported in the table correspond to values established for the model sites described in Chapter 4, and represent the following acreage ranges: one acre, one- to two-acre starts; three acres, two- to four-acre starts; and five acres, four- to five-acre starts.

²Starts in States with equivalent Erosion and Sediment Control Programs have been removed.

³EPA estimates that of the approximately 129,675 Phase II construction starts estimated for 1998, 19,452 (15%) would qualify for a waiver from program requirements. The remaining 110,223 would require erosion and sediment controls.

3.4 Water Quality

Analysis of the incremental benefits of the rule required that EPA characterize existing water quality and the relative impact of Phase II sources on water quality. The National Water Quality Inventory Report to Congress (US EPA, 1998a) is the only national comprehensive source of data characterizing the extent and sources of impairment of the nation's waters. These data, often referred to as "305(b) data," are reported biennially by states, territories, and tribes as required under Section 305(b) of the CWA. The 1998 Report to Congress is based on water quality data from 1994–1995. For the purposes of this analysis, EPA assumed that current water quality is reflected in the current 1998 Report to Congress.

The 305(b) data identify the designated uses of the waterbodies surveyed by the states. Designated use categories include aquatic life support, fish consumption, primary contact (swimming), secondary contact (boating), drinking water supply, and agriculture. States then compare monitoring data with numeric criteria established for each designated use to classify these waters as fully supporting, threatened, or impaired. Threatened waters are defined as waters that support beneficial uses now but may not in the future unless action is taken. Impaired waters are the sum of waterbodies partially supporting or not supporting their designated use. Exhibit 3–4 presents a summary of the water quality data provided in the most recent 305(b) data. In addition to general water quality impairment, the National Water Quality Inventory provides the percentage of surveyed waters considered impaired by designated use. These data are presented in Exhibit 3–5.

3.4.1 Water Impaired by Urban Wet Weather Events

The 305(b) data also identify the sources of water quality impairment. As shown in Exhibit 3–6, urban storm water runoff ranks as the second leading source of impairment to estuaries, the third leading source of impairment to lakes, and the fifth leading source of impairment to rivers. In addition to this information, the 305(b) data also provide the *percentage* of all waters where various pollution sources cause major impairment. The sources of pollution that are relevant to the Phase II rule are urban runoff/storm sewers, construction and land development. The contribution of these sources to water quality impairment are summarized in Exhibit 3–7.

Exhibit 3–4. Summary of Assessed Waters

Waterbody Type	Number of Miles ¹		Assessment of Designated Use Attainment ²		
	Total	Surveyed	Supporting	Threatened	Impaired
Rivers and Streams	3,600,000	693,905	56%	8%	36%
Lakes, Ponds, and Reservoirs	41,600,000	16,800,000	51%	10%	39%
Great Lakes	5,521	5,186	2%	1%	97%
Estuaries	39,839	28,818	58%	4%	38%

¹Lakes, ponds, and reservoirs are measured in acres; Great Lakes are measured in shoreline miles; Estuaries are measured in square miles.

²Percent of surveyed miles.

Source: US EPA (1998a). Reflects monitoring from 1994 and 1995.

Exhibit 3–5. Summary of Assessed Waters by Designated Use

Waterbody	Designated Use	Miles/Acres Assessed	Percent of Miles/Acres Impaired
Rivers	Aquatic Life Support	641,611	32%
	Fish Consumption	316,811	17%
	Primary Contact—Swimming	332,152	21%
	Secondary Contact—Boating	200,641	20%
Lakes, Ponds, and Reservoirs	Aquatic Life Support	14,200,153	31%
	Fish Consumption	10,896,449	35%
	Primary Contact—Swimming	15,369,354	25%
	Secondary Contact—Boating	8,306,333	25%
Great Lakes	Aquatic Life Support	5,186	72%
	Fish Consumption	5,186	98%
	Primary Contact—Swimming	5,186	4%
	Secondary Contact—Boating	4,844	4%
Estuaries	Aquatic Life Support	23,921	30%
	Fish Consumption	15,821	24%
	Shellfish Consumption	16,567	28%
	Primary Contact—Swimming	24,087	16%
	Secondary Contact—Boating	14,086	24%

Source: US EPA (1998a).

Exhibit 3–6. Leading Sources of Water Quality Impairment Related to Human Development

Rank	Rivers	Lakes	Estuaries
1	Agriculture	Agriculture	Industrial point sources
2	Municipal sewage treatment plants	Unspecified nonpoint sources	Urban runoff/storm sewers
3	Hydrologic/habitat modification	Urban runoff/storm sewers	Municipal sewage treatment plants
4	Resource extraction	Municipal sewage treatment plants	Agriculture
5	Urban runoff/storm sewers	Hydrologic/habitat modification	Combined sewer overflow

Source: US EPA (1998a).

Exhibit 3–7. Major Impairment by Pollution Source

Source of Impairment	Percentage of Miles/Acres Impaired			
	Rivers and Streams	Lakes, Reservoirs and Ponds	Great Lakes	Estuaries
Urban Runoff/Storm Sewers	3%	6%	1%	11%
Construction	1%	2%	1%	1%
Land Development	1%	0%	0%	0%

Source: US EPA (1998a).

3.4.2 Waters Impaired by Phase II Sources

To establish the baseline water quality impairment potentially attributable to Phase II sources, EPA first needed to determine the percentage of the nation's waters impaired by the three relevant sources of pollution. However, the 305(b) data characterize only the impairment of *surveyed* (assessed) waterbodies. Therefore, to establish a baseline representing all waters, EPA assumed that the 305(b) impairment data characterize all US waters. EPA then multiplied by the percent of waters that suffer impairment where the major cause of that impairment is due to urban runoff/storm sewers, construction, and land development as presented in Exhibit 3–7. As a result, the percent of aquatic life impairment in rivers and streams for which Phase II urban runoff/storm sewers are the major cause of impairment is as follows:

$$(\% \text{ of waters impaired}) \times (\% \text{ of waters impaired by urban runoff/storm sewers}) \text{ or } (32\%) \times (3\%) = 0.96\%$$

The results of these equations are presented in Exhibit 3–8.

Exhibit 3–8. Percentages of Waters Impaired by Storm Water Sources by Designated Use

Designated Use	Urban Runoff/ Storm Sewers	Construction	Land Development
Rivers and Streams			
Aquatic Life Support	0.96%	0.32%	0.32%
Fish Consumption	0.51%	0.17%	0.17%
Primary Contact—Swimming	0.63%	0.21%	0.21%
Secondary Contact—Boating	0.60%	0.20%	0.20%
Lakes, Ponds, and Reservoirs			
Aquatic Life Support	1.86%	0.62%	N/A
Fish Consumption	2.10%	0.70%	N/A
Primary Contact—Swimming	1.50%	0.50%	N/A
Secondary Contact—Boating	1.50%	0.50%	N/A
Great Lakes Shoreline			
Aquatic Life Support	0.72%	0.72%	0.00%
Fish Consumption	0.98%	0.98%	0.00%
Primary Contact—Swimming	0.04%	0.04%	0.00%
Secondary Contact—Boating	0.04%	0.04%	0.00%
Estuaries			
Aquatic Life Support	3.30%	0.30%	N/A
Fish Consumption	2.64%	0.24%	N/A
Shellfish Consumption	3.08%	0.28%	N/A
Primary Contact—Swimming	1.76%	0.16%	N/A
Secondary Contact—Boating	2.64%	0.24%	N/A

Source: US EPA (1998a).

Note: N/A = Not Available

Using the percentages of impairment presented in Exhibit 3–8, EPA approximated the proportion of impairment specifically attributable to Phase II sources by examining the relevant municipal population and construction activity. Phase II municipal programs may be instrumental in improving waters impaired by urban runoff and storm sewers. As discussed in Section 3.2, 37.4% of the population resides in automatically designated Phase II municipalities. Multiplying the percent of waters impaired by urban runoff and storm sewers, shown in Exhibit 3–8, by 37.4% yields estimates of impairment caused by those Phase II municipalities.¹ The equation for

¹ To the extent that potentially designated municipalities do indeed become part of the Phase II municipal universe, the percentage of the population residing in Phase II municipalities will increase. This will increase the percentage of waters impaired by the Phase II municipalities as well as both the benefits and costs of the rule. Likewise, to the extent that Phase II municipalities with populations less than 1,000 are waived from the Phase II rule, the percentage of population residing in Phase II municipalities will decrease. This will decrease the percentage of water impaired by the Phase II rule as well as both the benefits and costs of the rule. EPA expects that the increases or decreases in the benefits and the costs will be proportional.

the impairment of aquatic life support in river and streams caused by Phase II urban runoff/storm sewers is:

(% impairment caused by urban runoff/storm sewers) \times (% of population residing in Phase II municipalities) or

$$(0.96\%) \times (37.4\%) = 0.36\%$$

The results are presented in Exhibit 3–9.

Similarly, Phase II construction site controls may be instrumental in improving waters impaired by construction and land development activities. Multiplying the percent of waters impaired by construction and land development shown in Exhibit 3–8 by 24.9% (the percentage of Phase II construction starts, see Section 3.3) results in estimates of impairment caused by Phase II land disturbing activities. For example, the calculation for the impairment of aquatic life support in river and streams caused by Phase II construction is:

$$\begin{aligned} &(\text{of impairment caused by construction}) \times (\% \text{ of Phase II construction starts}) \text{ or} \\ &(0.32\%) \times (24.9\%) = 0.08\%. \end{aligned}$$

These results are also shown in Exhibit 3–9.

3.5 Potential Limitations Associated with the Baseline Assumptions

There are a number of potential limitations associated with the analysis of existing programs and water quality in terms of providing a baseline for estimating benefits and costs. Although uncertainties exist in terms of defining the potentially regulated universe, the most difficult issues may be associated with assessing water quality. One limitation associated with use of the 305(b) data is that they are collected by numerous individuals with varying levels of expertise. That is, each individual applied his or her own judgment concerning interpretation of the survey instructions and findings. Another limitation is that the 305(b) surveys cover only a portion of the nation's waters, as indicated in Exhibit in 3–4. Therefore, EPA's assumption that 305(b) data characterizes the impairment of unassessed waters may or may not be accurate. In addition, these data reflect water quality in 1996 which may not be fully representative of current impairment levels.

3.0 Baseline for Estimating Benefits and Costs

Exhibit 3–9. Percent of Waterbody Impairment Potentially Attributable to Phase II Sources

Designated Use	Urban Runoff/ Storm Sewers ¹	Construction ²	Land Development ²	Total Phase II ³
Rivers and Streams				
Aquatic Life Support	0.36%	0.08%	0.08%	0.52%
Fish Consumption	0.19%	0.04%	0.04%	0.28%
Primary Contact—Swimming	0.24%	0.05%	0.05%	0.34%
Secondary Contact—Boating	0.22%	0.05%	0.05%	0.32%
Lakes, Ponds, and Reservoirs				
Aquatic Life Support	0.70%	0.15%	N/A	0.85%
Fish Consumption	0.79%	0.17%	N/A	0.96%
Primary Contact—Swimming	0.56%	0.12%	N/A	0.69%
Secondary Contact—Boating	0.56%	0.12%	N/A	0.69%
Great Lakes Shoreline				
Aquatic Life Support	0.27%	0.18%	0.00%	0.45%
Fish Consumption	0.37%	0.24%	0.00%	0.61%
Primary Contact—Swimming	0.01%	0.01%	0.00%	0.02%
Secondary Contact—Boating	0.01%	0.01%	0.00%	0.01%
Estuaries				
Aquatic Life Support	1.23%	0.07%	N/A	1.31%
Fish Consumption	0.99%	0.06%	N/A	1.05%
Shellfish Consumption	1.15%	0.07%	N/A	1.22%
Primary Contact—Swimming	0.66%	0.04%	N/A	0.70%
Secondary Contact—Boating	0.99%	0.06%	N/A	1.05%

¹Calculated by multiplying the percentages in Exhibit 3–9 by 37.4%. For example, the calculation for impairment to aquatic life support in river and streams is: $(0.96\%) \times (37.4\%) = 0.36\%$. Results subject to rounding.

²Calculated by multiplying the percentages in Exhibit 3–9 by 24.9%. For example, the calculation for impairment to aquatic life support in river and streams caused by construction is: $(0.32\%) \times (24.9\%) = 0.08\%$. Results subject to rounding.